Safety at LLNL

For Employees, Contractors, and Visitors

Lawrence Livermore National Laboratory
University of California

UCRL-TB-135511
October 1999

"My absolute statement to you is never sacrifice safety for any other consideration. If you are asked to do so, let me know. Safety comes before anything else in doing your work. If it can't be done safely, then don't do it."

C. Bruce Tarter
Director, LLNL

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Introduction

Whether you work in an office, use heavy equipment, conduct research in a laboratory, or prepare for emergency response, the Laboratory's goal is to provide you with a safe, accident-free environment and the resources you need to perform your work safely. This booklet will provide you with the tools you need to go home safe and sound at the end of each day.

This booklet summarizes the environment, safety, and health program at the Lawrence Livermore National Laboratory (LLNL). It describes the types of hazards you may encounter while working and ways to protect yourself and others. It describes your rights and responsibilities as well as ways to resolve safety issues. It also describes the approach that all LLNL personnel—University of California employees, contractors working under LLNL supervision, visiting staff, students, and guests—must use to plan and carry out work activities.

You play a critical role in ensuring your own safety and the safety of those around you. While at LLNL, follow these basic guidelines:

- Understand your work and the hazards associated with it.
- Obey all procedures, signs, and emergency instructions.
- Practice work activities that ensure your safety and the safety of others.
- Maintain your existing skills and acquire new skills through training courses.
- Assure that you and your coworkers are physically capable and mentally prepared to perform the work safely.
- Work with your supervisor to resolve questions and improve operational performance and safety.
- Follow the LLNL Integrated Safety Management process to plan and carry out your work activities.

And remember, if it can't be done safely, don't do it.

The Laboratory's Safety Philosophy

The Laboratory strives to maintain a healthy, accident-free, and environmentally sound workplace and community while pursuing scientific and technical excellence. We believe that:

- Accidents are preventable.
- Safety is our most important day-to-day consideration.
- Managers and supervisors create safe work environments.
- Supervisors ensure that everyone understands the safety expectations and work controls.
- YOU are responsible for safety.

For the purposes of this booklet, the term "safety" is synonymous with the term "environment, safety, and health" (or ES&H). It encompasses protection of employees, the public, and the environment.

Our Safety Challenge

At LLNL, we take safety seriously. Simply put, working safely is our way of doing business. But our safety record has not always lived up to our words in recent years. We have had a series of accidents and near misses at the Laboratory that could have resulted in serious injury to our employees. These accidents emphasize that we face a basic safety challenge: improving our safety performance.

To do this, we face two tasks. Collectively, we must ensure that LLNL operations are planned and executed in a manner that builds safety into all work activities. Individually, we must develop a new safety consciousness. We must adopt a safety ethic that is reflected every day in our work habits. Our Integrated Safety Management system was developed with this challenge in mind.

Integrated Safety Management

Integrated Safety Management (ISM) is a process that integrates safety into work planning and execution. It makes safety a conscious process for everyone. Additionally, ISM enables you to clarify your responsibilities so that you can focus on your work while performing it safely.

The Laboratory's Fundamental Safety Principle

At the foundation of ISM is the principle that YOU are responsible for your own safety and the safety of those around you. Whether you are a worker, supervisor, or manager, you must promote a healthy, accident-free, environmentally sound workplace and community. Everyone at LLNL must reinforce this culture.

The Seven Guiding Principles

Seven guiding principles support the fundamental safety principle. They form the basis of the Laboratory's ES&H management system.

- **Line management is responsible for safety.** For every work activity, an identifiable line management chain is ultimately responsible. Know your line management chain, and particularly your task or work supervisor.

- **Clear roles and responsibilities are established and maintained.** All organizational levels must maintain clear and unambiguous lines of authority and ES&H responsibility. You must know the roles and responsibilities associated with your job. If you do not, talk to your work supervisor.

- **Personnel possess competence commensurate with responsibilities.** Employees, contractors, and visitors must have the necessary experience, skills, and knowledge to perform their work. If you feel you are not properly trained for your job, talk to your work supervisor.

- **Resource allocations are balanced, making ES&H a priority in project planning and execution.** Make sure that project resources—funding, equipment, time, and staff—are allocated in a manner that will accomplish the work safely.

- **Safety requirements are identified and implemented.** Before performing work, always evaluate the hazards and select appropriate controls. Make sure that the controls are in place and that everyone understands them.

- **Hazard controls are tailored to the project work.** Engineered and administrative controls, such as interlocks and safety plans, as well as personal protective equipment help minimize hazards. Tailor these controls to the work being performed.

- **Operations are authorized before work begins.** Verify that all ES&H and operational requirements are satisfied before you start any work activity. Make sure you have been authorized to do the work before you begin.

The ISM Work Planning Process

But how do you apply these principles to your work? The ISM work planning process, with its five core functions, can help you (see Figure 1).

The ISM process integrates safety into each phase of the work cycle. There are five steps in the ISM process.

- **Function 1**: Define your work activity and assess its scope. Determine everyone's roles and responsibilities and communicate this information to them.
- **Function 2**: Identify the hazards and environmental impacts for both routine and nonroutine activities. Determine the level of hazard involved.
- **Function 3**: Select and put in place appropriate ES&H controls given the hazard level. You may need documentation (e.g., environmental permits and safety plans) for some work activities. Your ES&H Team can assist you in selecting controls.
- **Function 4**: Ensure that the selected controls work properly and obtain authorization to begin work. Perform the work safely in accordance with your plans.
- **Function 5**: Monitor the work activity, gathering information and identifying ways to improve safety performance. This includes passing along "lessons learned" and modifying your initial work plan if necessary.

Use the ISM process to plan and carry out all your work activities.

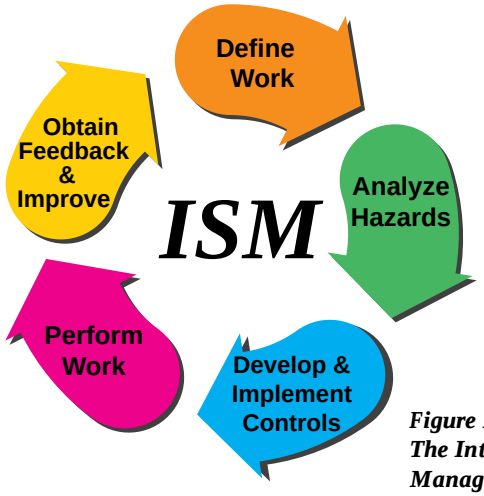

Figure 1. The Integrated Safety Management process.

Applying ISM to Your Work Activities

Integrated Safety Management is a straightforward, five-step safety process. Boiled down to its essential elements, ISM requires you to look at what you need to do and figure out what might be dangerous about the job. Consider all the possibilities, and then create a plan for how you can work safely. Your plan should eliminate or control the hazards. Once the controls are in place and you have authorization to begin, you are ready to do your work. As you are working, and again when you finish, ask yourself if your controls are effective and how you could do it better next time.

If you need help with ISM, talk to your ES&H Team. The Laboratory has four ES&H Teams to answer your questions and provide access to many safety resources. Each team contains ES&H specialists and technicians from the Environmental Protection, Health Services, and Hazards Control Departments. The teams can assist you with hazard identification and provide guidance on appropriate controls to eliminate or minimize those hazards. Your ES&H Team is identified on the Hazards Control assistance signs (see Figure 2) located throughout each building. You can also find your ES&H Team on the list located inside the back cover of this booklet.

Figure 2. Sample Hazards Control assistance sign.

To give you a better understanding of ISM and how it applies to you and your activities at LLNL, this booklet will examine the ISM process in greater detail. If you still have questions, talk to your work supervisor or your ES&H Team. Or visit the ES&H Home Page at http://www.llnl.gov/es_and_h/esh.html.

Function 1: Defining the Scope of Work

Always define and plan the work you will do before initiating any work activity. Your initial decisions should include intended work procedures to be followed, the personnel who will be conducting the operation, as well as the materials and equipment to be used. You also need to evaluate whether the available resources are adequate to do the work safely. You can use the Integration Work Sheet to help you or talk to your ES&H Team. You may want to modify your original work decisions after some consideration. That's okay. Pre-work planning—thinking about what you need to do and considering all the possibilities—is what ISM is all about.

Function 2: Analyzing the Hazards

Due to the diverse nature of work performed at LLNL, the hazards you may encounter will vary. Keep in mind that hazards are only potential problems. The presence of a hazard does not mean you will experience its adverse effects. Although this booklet provides you with information on a wide range of hazards, the likelihood of injury is small. As Figure 3 shows, most injuries that occur at LLNL involve cuts, bruises, strains, and sprains. These percentages have remained relatively consistent over time.

To assure an acceptable risk from any hazard, you should follow the ISM process and analyze the potential hazards. This analysis can be broken down into two parts: hazard identification and safety impact analysis. This booklet will identify numerous potential hazards and then discuss how to analyze them. Hazards generally fall into two categories: health and safety hazards and environmental hazards.

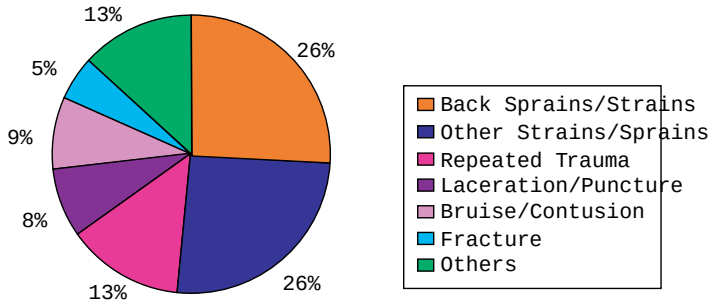

Figure 3. Lost and restricted work days in 1998.

Health and Safety Hazards

Numerous health and safety hazards exist at LLNL. These include chemical, biological, physical, and reproductive hazards.

Chemical Hazards

LLNL personnel use a wide range of hazardous chemicals in their work activities, including commercial products, mixtures, solvents, cleaning products, and lubricants. Many of these chemicals are poisonous, irritating, corrosive, flammable, or explosive. Materials can be hazardous in multiple ways. For example, benzene is both flammable and carcinogenic. Additionally, some chemicals are relatively safe when used alone but can become dangerous when mixed with other substances.

Extremely toxic chemicals and those with unique hazards require written safety plans and training before you can use them. Examples of these chemicals include beryllium, fluorine, and some cancer-causing chemicals. Consult your ES&H Team for specific requirements.

Cancer-causing Substances

Some materials at LLNL are controlled because they might cause cancer. Examples of carcinogens (cancer-causing substances) include asbestos, benzene, arsenic, and methylene chloride. LLNL has strict policies on the purchase and handling of these materials.

A common carcinogen found at LLNL is asbestos. Inhaled asbestos fibers have been proven to cause cancer. Therefore, LLNL has an asbestos control policy that applies stringent engineering, administrative, and personal protective equipment controls to any operation that has the potential for exposing personnel to airborne asbestos fibers. (See *ES&H Manual*, Volume II, "Safe Handling of Asbestos-containing Material During Construction Work.") Sources of asbestos at LLNL include building materials such as pipe insulation, flooring, and fire doors, especially in the World War II-era buildings in the southern part of the Livermore site. Asbestos in good condition does not pose a hazard to personnel. If you encounter an unknown material in a deteriorating state, contact your ES&H Team for material identification and evaluation. If your job assignment involves working directly with asbestos or other carcinogen-containing materials, you will require extensive training.

Lead

Lead is often used at LLNL. Examples of lead-containing materials include lead paint pigments or primer, vehicle batteries, lead shielding, ammunition primer and bullets (at the Site 300 target range), and solder. Although elevated lead exposure levels are uncommon at LLNL, you may encounter low levels as part of your job.

Long-term overexposure to lead can cause numerous health problems and may ultimately prove fatal. Your body absorbs lead through your lungs, mouth, and stomach. Therefore you must avoid breathing lead dust or getting lead particles in your mouth. Your supervisor or ES&H Team can tell you how to protect yourself from workplace lead. Contact the Health Services Department if you develop symptoms such as nausea, constipation, weakness, or dizziness after working with lead.

Biological Hazards

At LLNL you may use or handle certain biological materials that are hazardous. A biohazardous material is any biological material capable of causing disease or infection in an otherwise healthy human. Work with biohazardous materials must occur in designated work areas and requires safety plans and special work practices. Additionally, if you handle human blood or other potentially infectious materials, you must take the course, "Working Safely with Blood and Blood-Borne Pathogens." You may also be offered a Hepatitis B vaccine. Contact the Health Services Department for details.

Site 300/San Joaquin Valley Fever

Site 300 is an explosive and experimental testing area located 15 miles east of the Livermore site in the hills of San Joaquin County. If you work at Site 300, you must take the course, "Health and Safety for Employees and Visitors at Site 300." This course presents the hazards you may encounter in Site 300 activities and the safety controls you must observe while working at the site.

Valley Fever, a respiratory infection common throughout the San Joaquin Valley, can be contracted at Site 300. Prior to a work assignment at Site 300, you should determine if you are immune to this infection. The Health Services Department can administer the simple skin test. Contact your supervisor or Health Services for more information.

Physical Hazards

Confined Spaces

Almost daily, personnel at LLNL enter manholes, electrical vaults, and underground utility spaces. These are confined spaces that may contain atmospheres that do not sustain life or are toxic or flammable. These spaces may also present hazards due to limited access and work with

electrical and mechanical equipment. Confined spaces might contain spiders and insects, and at Site 300, snakes. Other types of enclosures, such as storage tanks and experimental structures, may also be confined spaces that could pose a hazard to individuals who enter them.

Confined spaces are proven killers. Before working in a confined space, the air inside the space must be tested by a trained person to ensure that it is safe. If you plan to enter a confined space, you must verify that a valid entry permit exists. You and your supervisor must also receive training.

Electrical Equipment and Hazardous Stored Energy

LLNL has developed a comprehensive safety program to warn you of and to mitigate the hazards posed by electrical systems and equipment. If you work with or maintain electrical equipment such as research equipment, high-voltage power supplies, or capacitors, you must take the required electrical safety training before conducting such work.

Additionally, if you perform maintenance or repairs on machines, components, or equipment that would be hazardous if accidentally restarted, you must attend training and satisfy the Laboratory's lockout and tag requirements. These procedures ensure that equipment is stopped and isolated from energy sources before service or maintenance begins. Under no circumstances should you attempt to start equipment that has been locked or tagged. If you need to energize locked or tagged equipment, notify your work supervisor.

Ergonomics

Ergonomics is the science of designing work environments that fit the worker. This means examining the interaction between you and your environment and the equipment you operate. Application of ergonomic principles can reduce your work-related injuries whether you work with computers, in a job with heavy physical requirements, or perform tasks such as material fabrication, painting, gardening, and custodial work.

Many ergonomic disorders are felt as strains and sprains. Acute muscle strains occur when a single event overstresses the body. Chronic strains and cumulative trauma disorders result from minor stresses that accumulate over time and may lead to long-term disability. The four contributing causes of these injuries are repetitive actions; awkward positions; use of excessive force; and lack of rest.

Consult your ES&H Team for a workplace assessment to prevent ergonomic injuries. Report any recurrent pain, numbness, or tingling to the Health Services Department immediately. You should also notify your work supervisor of these symptoms.

Explosives

LLNL has an extensive research program for developing and testing explosives, both at the Livermore site and Site 300. While explosives are permitted at LLNL, you may not conduct explosives work (no matter how small the quantity) unless an approved safety plan explicitly authorizes it. The Laboratory provides training to all personnel who handle or transport explosives. Participation in a medical surveillance program also may be required for some explosive workers.

Forklifts, Hoists, and Cranes

Operators of forklifts, hoists, and overhead cranes must obtain a license for use of that equipment. You must complete the LLNL-provided training prior to equipment operation unless you have proof of equivalent training. All personnel must demonstrate safe equipment operation to their work supervisor and may need a physical examination.

Ionizing Radiation

Radiation can be either nonionizing or ionizing. (See the next section for more information on nonionizing radiation.) The radiation referred to in this section is ionizing radiation—invisible particles or waves of energy emitted from unstable (i.e., radioactive) atoms and radiation-generating devices (RGDs). Common types of ionizing radiation are alpha, beta, neutron, x-ray, and gamma radiation. Some atoms are naturally radioactive; others can be made radioactive in reactors or accelerators.

The Laboratory uses a variety of radioactive materials such as tritium, uranium, and plutonium and RGDs such as x-ray machines, electron beam devices, and accelerators. To ensure individuals are aware of the potential hazards associated with these activities, LLNL requires everyone to receive General Employee Radiological Training (GERT) prior to receiving occupational exposure or being allowed unescorted access into areas posted with the radiation symbol. If you will be performing assignments as a radiological worker, additional training is required.

For LLNL and supplemental labor employees, GERT is initially provided as part of new staff orientation. The biennial retraining requirement is satisfied by reading the GERT booklet. Visitors and other contractors must complete the web-based course or sign and carry the card found on the

back of the GERT booklet to document their training. Individuals who have completed GERT may escort untrained workers into areas requiring GERT training. The escort must ensure that the untrained worker complies with the posted radiation safety requirements.

If radiation energy is deposited in a person, he or she receives a radiation dose. Everyone receives a dose from background radiation in our environment. It primarily comes from cosmic rays, radioactive material in the earth, ingestion of naturally occurring radionuclides in food (such as potassium-40), and inhalation of radon gas. In the United States, the average background radiation dose is 300 millirem / year. [Radiation doses are measured in units of millirem (mrem).] Manufactured sources contribute an additional dose of approximately 60 mrem / year. Of this dose, about 54 mrem / year is from medical procedures (e.g., x rays and certain diagnostic tests). Consumer products such as lantern mantles and smoke detectors contribute roughly 5 mrem / year. Fallout radiation, still present in our environment, contributes less than 1 mrem / year.

A dosimeter measures the radiation dose a person receives from external radiation sources. All LLNL and supplemental labor employees must wear an LLNL radiation dosimeter while onsite. Visitors and temporary contractors are required to wear a dosimeter if they enter areas posted with the radiation symbol. To obtain a dosimeter, the GERT booklet, or more information, call "2 GET 1" (ext. 2-4381).

Lasers and other Nonionizing Radiation Sources

Nonionizing radiation includes laser light, radio waves, microwaves, and electric and magnetic fields. A laser is a device that produces an intensely concentrated beam of light that can travel over long distances with minimum spreading. Many types of lasers are used at LLNL, from the small laboratory lasers to the giant lasers used in the future National Ignition Facility (NIF). Most lasers are capable of causing eye injury if you look directly into the beam or its reflection off a mirror-like surface. Some high-power laser beams can also burn exposed skin, ignite flammable materials, or heat materials that may release hazardous fumes, gases, or intense light. Radiofrequency energy and electromagnetic fields may be hazardous to people with cardiac pacemakers and other medical electronic devices.

You must receive training before working with lasers or other sources of nonionizing radiation. Additionally, contractors and visitors can operate lasers only when explicitly authorized to do so. However, no training is necessary to work with consumer or office electrical appliances, which generate limited nonionizing radiation.

If you work in areas where you may be exposed to high-power laser beams (i.e., Class 3b or 4 lasers), you must have a baseline eye exam prior to your work assignment. An exam is also required following accidental eye exposure. Report all accidental exposures to your work supervisor.

Noise

Exposure to excessive noise levels, whether at work or at home, can result in permanent loss of hearing, development of tinnitus (i.e., ringing of the ears), increased blood pressure, and stress-related problems. Noise may also cause annoyance, difficulty in communication, and inability to work effectively and safely. Hearing loss can occur as a result of continual noise exposure or brief exposure to very loud noise.

In order to protect workers from harmful noise, LLNL has instituted a hearing conservation program. This program includes identification of noise hazards and exposed personnel, implementation of noise-reducing controls, and distribution of personal hearing protection. It also involves hearing tests and training. Contact your ES&H Team if you have questions or want a noise survey done in your work area. The Health Services Department can help if you have concerns about noise-induced hearing loss.

Portable Hand and Power Tools

Work at LLNL may require portable hand and power tools. Tool operators must ensure that the tools they use are in safe operating condition. Inspect tools prior to use and turn over defective tools to your supervisor for repair. Always use the proper tool for the task and use the proper machine tool guards.

Some construction and maintenance activities at LLNL require powder-actuated tools, such as stud drivers and nail drivers. While the tools used are the low-velocity type, they operate with a powder charge, and therefore, must be treated with the same caution as a gun. If you plan to use a powder-actuated tool, you must receive training on the disassembly, cleaning, maintenance, and limitations of that tool. The training is generally provided by outside contractors through Plant Engineering. After you have been trained on a specific tool, you will be issued an operator's card for that tool.

Pressure Systems
Workers at LLNL conduct many research projects that depend on pressure systems for supplying gases and liquids. Therefore, LLNL developed a pressure safety program to ensure that pressure systems are designed, tested, and operated safely. The program requires personnel who work with pressure systems to receive training. The amount of training depends on each job's particular needs and ranges from a general orientation to certification for pressure system installers.

Slips, Trips, and Falls
Some safety hazards are universal. Slips, trips, and falls can injure anyone and are a significant cause of lost-time injuries at LLNL.

To avoid these hazards, remain alert to your surroundings. Keep all areas—including offices, research labs, and shops—clean and orderly, and use them only for approved activities. Keep stairs, corridors, and doorways clear of obstruction. Avoid placing office furnishings and telephone or extension cords where they may cause tripping or obstruct exits. Store materials in appropriate cabinets or designated storage areas.

Stairs and Ladders
Stairs and ladders are used every day at LLNL. Inspect ladders before use to ensure they are in safe condition. Do not carry loads while climbing ladders. Hold onto railings while using stairs. Report any unsafe conditions to your supervisor.

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Step stools are used in many work areas and are usually equipped with retractable casters. Inspect step stools before use to ensure they are in safe condition. If a step stool requires maintenance, turn it in to your supervisor.

Reproductive Hazards
Exposure to hazardous substances such as heavy metals, some organic compounds, anesthetic gases, and ionizing radiation can impact both male and female reproduction. If you would like more information on reproductive health, contact the Health Services Department (ext. 2-7459) or visit its web page http://www.llnl.gov/healthserv/. If you become pregnant, contact Health Services for a confidential workplace evaluation.

Environmental Hazards
Workers at LLNL must be familiar with the environmental regulations applicable to their job. You must comply with all federal and state regulations as well as LLNL requirements for waste generation, characterization, storage, disposal, and spills or releases into the environment (e.g., air, soil, stormwater, sewer, or retention tanks). If you have questions on environmental issues, contact your ES&H Team.

Hazardous Wastes
Always dispose of hazardous wastes properly. Never pour hazardous liquids down the drain or put hazardous materials in the trash. If you have questions about storage or disposal of potentially hazardous materials, contact your ES&H Team or the Hazardous Waste Management Hotline (ext. 3-4806).

Transporting Hazardous Materials
Transporting hazardous materials, whether onsite or offsite, must be conducted with the appropriate packaging, labeling, and documentation in accordance with LLNL procedures. Additionally, offsite transportation of hazardous materials must comply with Department of Transportation regulations. If you have questions concerning transportation or shipment of hazardous material, (i.e., non-waste), contact your ES&H Team or the HWM Hotline. To arrange for pickup and transportation of hazardous waste, contact your HWM field technician.

Safety Impact Analysis
Once you have identified the hazards, you must analyze their impacts to you, your coworkers, the public, and the environment. Consider factors that could alter the degree of impact the hazards will have. In other words, determine each hazard's maximum impact, especially if it is a nonroutine hazard. Also remember to check for facility constraints and screen existing documentation.

Function 3: Developing and Implementing Controls
To avoid injury, you must recognize the type and impact of hazards present in your work and take protective measures. Develop a safe work plan that eliminates or controls these relevant hazards. Your ES&H Team can help you select the appropriate controls.

Engineered controls (such as interlocks, shielding, and secondary containment) and administrative controls (such as safety plans, procedures, and training) will help you work safely. Use engineered controls over administrative controls whenever possible. Personal protective equipment can also help minimize the effect of hazards to you. Tailor all controls to the work being performed.
Some basic safety controls are described on the next few pages.

Hazard Signs and Warning Lights

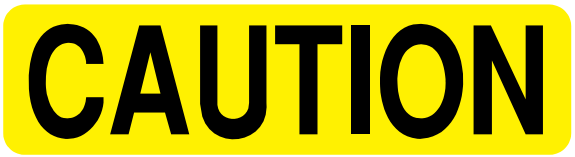
Signs and warning lights are used at LLNL to alert you when and where to watch for hazards. Each sign indicates the relative degree of danger and provides instructions or warnings. Familiarize yourself with the applicable safety requirements before you enter an area posted with these warning indicators. DO NOT enter an area marked as a construction, experimental, or restricted area unless an individual with responsibility for that area has authorized you to do so.

Three classes of warning signs and labels are used at LLNL to warn personnel of hazardous conditions.

A **red DANGER sign** indicates an immediate and serious hazard which, if not avoided, *will* result in death or serious injury. A blinking or rotating red warning light may be located nearby. DO NOT enter an area marked with these signs or operate equipment bearing a red tag unless authorized to do so. No one may work within an area bounded by red lights.

An **orange WARNING sign** indicates a hazardous situation which, if not avoided, *could* result in death or serious injury. A blinking or rotating orange warning light may be located nearby.

A **yellow CAUTION sign** indicates a hazardous situation which, if not avoided, *could* result in moderate injury. It may also alert you of unsafe practices. A blinking or rotating yellow warning light may be located nearby.



Two other types of signs are used at LLNL to notify personnel of safety-related information. A **green SAFETY sign** conveys *safety-related instructions* such as safe work practices, reminders of proper safety procedures, and the location of safety equipment.

A **blue NOTICE sign**, such as the hazards warning poster (see Figure 4), conveys *organizational policy* and other general safety information. Blue lights indicate operating equipment.

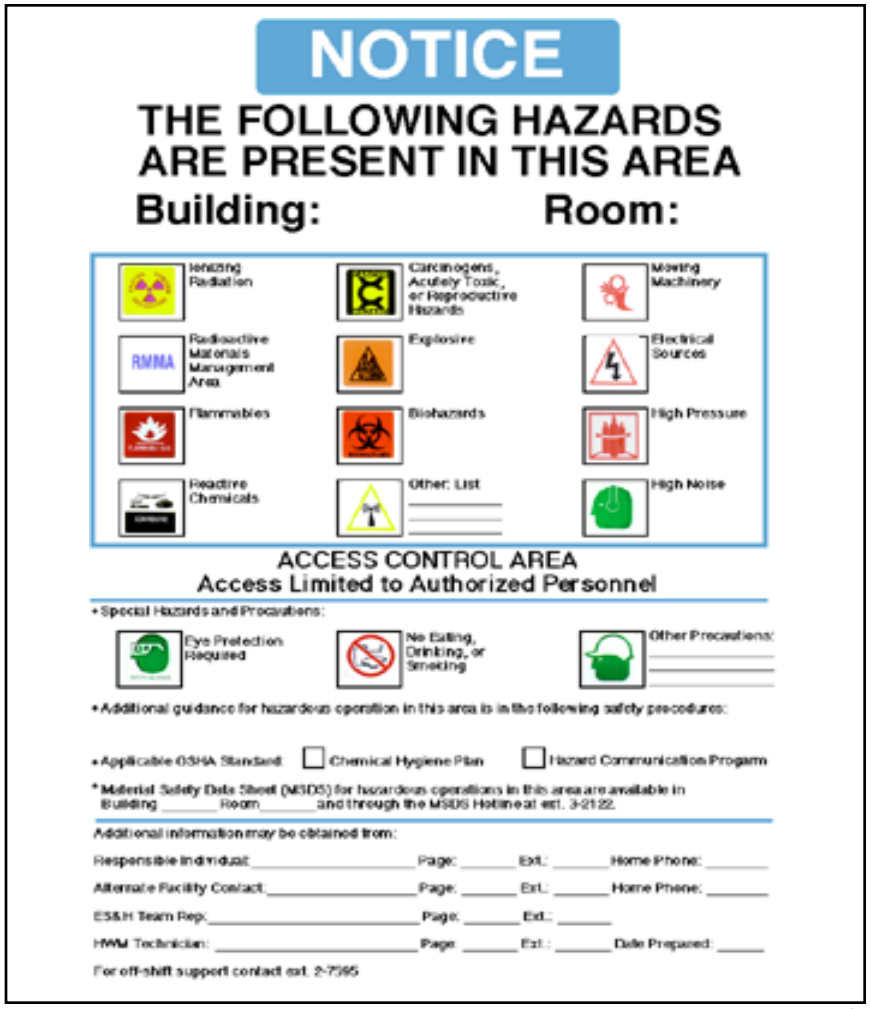


Figure 4. Sample hazards warning poster.

The hazards warning poster identifies major hazards present in each work area. If a particular hazard is present in your work area, it should be displayed on the poster. The poster also provides specific information such as special precautions, safety plans, and points of contact for additional help.

Documentation

The LLNL *Environment, Safety, and Health Manual* provides you with important information to help you work safely. Volume I describes ES&H responsibilities, policies, and general information. Volume II contains requirements and guidance on controlling health and safety hazards. Volume III summarizes the various environmental programs and requirements that affect LLNL operations. Volume IV contains other Lab-wide ES&H documents, such as training and quality assurance, while Volume V describes the special nuclear facility requirements. Everyone working at LLNL must be familiar with the information contained in the *ES&H Manual* as it applies to their job. You can find the manual online through the ES&H Home Page at http://www.llnl.gov/llnl_only/es_and_h/esh.html. The Home Page also provides links to other valuable resources, including policies, documents, and organizations.

You should also read and understand applicable safety plans, container labels, and material safety data sheets (MSDS). An MSDS is an expanded warning label that describes a chemical's hazards. To obtain copies of an MSDS, call the MSDS Hotline (ext. 4-4404) or find it online at http://www-orad2.llnl.gw/web2/chemtrack/msds/msds.html.

Training

The Laboratory offers safety training for all personnel. The LLNL Training Course Catalog provides information on ES&H courses. You can find it online at http://www.llnl.gov/llnl_only/training/course-query.shtml. T he courses cover a variety of disciplines and work situations. To take a course, contact your supervisor (or LLNL contact).

If a health and safety course is identified as computer-based training, it is available through the Hazards Control Department's Computer-based Training (CBT) Center. Call the CBT Center (ext. 3-1094) to schedule a time. If the course is available online (i.e., a "W" appears in the course identification number), you can take it at the CBT Center or on your office computer.

Before you can work with certain hazards, mandatory training is required. Your supervisor (or LLNL contact) will see that you are enrolled in the required courses. Successful completion of required training must be recorded in the Livermore Training Records and Information Network (LTRAIN).

For further information about safety, health, and emergency management courses at LLNL, contact the Hazards Control Education and Training Division (ext. 2-5158). You can obtain information on environmental courses by contacting the Environmental Protection Department Training Coordinator (ext. 2-5815) or by going online at http://www-epd2.llnl.gov/training/.

Personal Protective Equipment

Some work activities require special equipment such as laser eyewear, hearing protection devices, hard hats, safety shoes, and protective garments to protect your clothes, feet, hands, lungs, head, ears, and eyes. Certain hazards such as lasers or welding require eye protection. Work involving excessive noise levels requires hearing protection devices. Some jobs require lab coats, gloves, and safety glasses. You must use personal protective equipment (PPE) whenever you are in a work area that requires it and follow the safety plans for that activity. Keep in mind that PPE does not prevent accidents—it only protects you if an accident occurs.

Personal protective equipment requires either formal or informal training on how to properly use it. If you wear a respirator on the job, you must be medically approved and must complete special training, including regular fit testing performed at the respirator services facility in Building 324 (ext. 2-7910). Contact your work supervisor or your ES&H Team for more information on respirators and other types of PPE.

Function 4: Performing Work Safely

Many resources are available to help you work safely at LLNL. (See inside the back cover for a handy reference list.) Talk to your supervisor, your LLNL contact, or your ES&H Team if you have questions. Remember to perform a prestart review before you begin work. When you conduct your review, tailor it to the hazards involved and their potential consequences. Verify that all ES&H and operational requirements are satisfied before you begin. Make sure you have been authorized to do your work. While working, remember to always conduct work activities safely.

Resolving Safety Issues

If you see something happening at the Laboratory that's not safe, be sure to point it out. Say, "Stop—Let's do this safely." But what can you do if you have a safety concern that is not addressed?

There are several ways to resolve safety concerns at LLNL. You can contact:

- Your work supervisor (or your LLNL contact if you are a visitor).
- Your ES&H Team.
- Your employer, if you are a contractor or a visitor.
- Your facility manager or facility point-of-contact.
- DIALOGUE—via email or interoffice mail (mail code L-100).
- The Laboratory Site Manager (ext. 2-4951).
- The Deputy Director for Operations (ext. 2-2371).
- The University of California, Office of the President (UCOP). For instructions on reporting improper government activities and safety issues, refer to the UCOP Home Page at http://www.ucop.edu or call (510) 987-0350.

Do not let safety issues go unresolved. The Laboratory cares about your safety. Keep in mind that the University of California will protect you if you report improper activities and safety violations at LLNL. Retaliation or discrimination against you is strictly prohibited, even if it is later determined that the activity was safe.

Reporting Injuries and Illnesses

Laboratory employees, contractors, and visitors are required to report all incidents that are not part of normal operations. Make this report to your supervisor (or LLNL contact.)

If you are an LLNL employee and are injured or become ill as a result of a job-related exposure or incident, go promptly to the Health Services Department. Inform your supervisor of the situation as soon as possible.

If you are a contractor or a visitor at LLNL, Health Services will usually provide only basic first aid and emergency treatment. It is your employer's responsibility to provide you treatment for illness or injury. Report any occupational injury or illness to your LLNL supervisor (or contact) as soon as possible.

Emergency assistance for an employee, contractor, or visitor who is seriously ill or injured while at LLNL should always be obtained by dialing 911 (or 925-447-6880 from a cellular phone).

Returning to Work after Illness or Injury

Employees who miss work for medical reasons may need to report to Health Services for a return-to-work clearance. A clearance is required before returning to work if you:

- Lost one or more workdays due to an occupational illness or injury.
- Used five or more consecutive sick days for a non-occupational illness or injury.
- Were hospitalized or required surgery for a non-occupational illness or injury.

If you have questions about returning to work after an illness or injury, contact the Health Services Department (ext. 2-7459).

The Health Services Department also issues all LLNL medical restrictions, both temporary and permanent. Employees who receive medical restrictions from their private physicians should see Health Services for a reevaluation.

Function 5: Obtain Feedback and Improve Work Performance

Once your work activities conclude, review what you did and consider how you might improve next time. Monitoring the activity and gathering feedback and information can help you improve performance. If necessary, modify your initial work plan and share your "lessons learned" with others.

Medical Surveillance

Medical surveillance is required (or recommended) at prescribed intervals if your job involves certain physical, chemical, or biological hazards. It may also be required if you travel to some foreign countries. Supervisors, with the assistance of the ES&H Teams, must identify individuals that require medical surveillance. A baseline examination also may be required to determine an individual's physical and mental health status at the beginning of a medical surveillance period. Consult your ES&H Team for specific requirements.

Travel to certain countries can pose a health risk to you. Contact the Health Services Department for information on health concerns in various countries as well as to obtain the necessary immunizations (e.g., polio, diphtheria, and yellow fever) at least four weeks prior to departure.

Lessons Learned Program

The Laboratory has a program to gather, share, and use safety information obtained from within and outside LLNL. This information is presented in "Lessons Learned" fact sheets. You can find them online at http://www.llnl.gov/es_and_h/lessons/. If you have questions or suggestions for future topics, contact the Lessons Learned Coordinator (ext. 2-5136).

Your ES&H Rights and Responsibilities

As mentioned at the beginning of the booklet, the Laboratory strives to maintain a healthy, accident-free, and environmentally sound workplace and community. Therefore, you have certain rights and responsibilities in order to help meet this challenge.

Your Rights

You have the right to work in a safe and healthy environment free from recognized hazards. You have the right to:

- Know of potential exposure to harmful substances.
- Review your exposure records.
- Refuse work (or stop work) in conditions that could cause harm to you, others, or the environment.

You also have the right to know about hazards in your work environment. The Health Hazard Communication Program describes what LLNL is doing to protect your health and safety in the workplace. Information about this program is available from your work supervisor. LLNL also has an ES&H Hotline to address your safety concerns. The phone number for this and other ES&H resources is listed inside the back cover.

If you cannot resolve a safety issue in any other way, you also have the right to file confidential safety concerns with the local DOE office. (Refer first to page 22, "Resolving Safety Issues.") You can write a letter, submit Form 5480.4 (available from DOE), or phone in your concern to the Department of Energy, Environmental Safety and Health Division, DOE-OAK, 1301 Clay Street, Suite 700N, Oakland, California 94612. The phone number is (510) 676-1611.

Your Responsibilities

You are responsible for ensuring your safety and promoting a safe, healthful, and environmentally sound workplace and community. Therefore:

- Understand your work area's potential hazards and know the controls necessary to avoid them.
- Only perform work that your supervisor or LLNL contact has explicitly authorized you to perform.
- Comply with all ES&H regulations and standards.
- Keep your exposure to radiation and toxic materials as low as reasonably achievable.
- Promptly report all illnesses and injuries to the Health Services Department. For emergencies, dial 911 (or 925-447-6880 from a cellular telephone).
- Participate in mandatory training and required health and safety programs.
- Immediately correct ES&H-related problems or inform your supervisor of them.
- Know your work area's emergency plan.
- Warn fellow workers of hazards and defective equipment.
- Conduct ongoing work assessments, notify management of incidents, and carry out corrective actions when necessary.

Remember to ask your work supervisor for guidance when you are uncertain about work requirements. If you see an opportunity for improvement, bring it to his or her attention.

Additional Safety Issues

Now that you understand ISM as well as your rights and responsibilities, you know how to work safely at LLNL. But there are a few additional issues you should keep in mind as you perform your work activities.

Bicycle Safety

The Laboratory provides bicycles for onsite personnel use. You may use these orange bicycles during daylight hours. (They are not equipped with headlights for use after dark.) Check the bicycle to see if it is in good condition (e.g., seat is tight, tires inflated) and adjust the seat height. Do not ride a bicycle in need of repair. If you come across such a bicycle, turn it upside down. The bicycle repair shop will pick it up for service.

Ride all bicycles (LLNL and personal) with care and on the right side of streets and paths. Operate bicycles in accordance with the California Vehicle Code, and watch for vehicles and pedestrians. Bike riders under

the age of 18 must wear a helmet while riding any bicycle on LLNL property. Stay on paved roads and paths and avoid potholes and uneven surfaces. (Walk your bicycle through such areas.) Do not overload bicycle baskets, carry passengers, or "hand carry" objects. Do not ride up or down stairs and curbs or ride inside buildings.

Vehicle Safety

When driving a vehicle (personal, government, or your company's) onsite, operate it with concern for your safety and the safety of others. Operate your vehicle in accordance with the California Vehicle Code. You must have a valid driver's license, and you and your passengers must wear seat belts. Always observe the posted speed limits. The speed limit on LLNL roads is 25 mph and 15 mph in parking lots. Site 300's speed limit is 35 mph, unless otherwise posted. Due to the Livermore site's congested nature, use care when backing up vehicles and driving in parking lots.

If you violate LLNL traffic and parking rules, you will receive a citation and may have your onsite driving privileges suspended. Either the Protective Force Division or the California Highway Patrol will investigate onsite vehicle accidents, depending on the accident's severity. REMEMBER: You must yield the right-of-way to fire trucks, ambulances, and security vehicles with flashing lights.

Fire Extinguishers

Portable fire extinguishers allow you to contain small fires before they spread. But to use fire extinguishers properly, you must know the type of fire (e.g., ordinary combustibles, flammable liquids or metals, energized electrical equipment) as well as the extinguisher's capabilities. If you do not understand a fire extinguisher's limitations, you can cause injury or spread the fire. Therefore, you cannot use fire extinguishers at LLNL unless you have received training on their use. Always call 911 before using an extinguisher.

Emergency Preparedness

Immediate action is vital when dealing with emergencies such as injuries, fires, earthquakes, chemical spills, electrical shock, and airborne hazardous releases. The LLNL Emergency Dispatch Center is staffed continuously. Emergency dispatchers, Firefighters, Protective Service Officers (PSOs), and Health and Safety technicians are always on duty to provide assistance.

When you face an emergency, follow the procedures described on the back cover. Call 911 immediately even if the problem seems minor or you are not certain what is happening.

In the event of a large-scale emergency, LLNL has an emergency alarm and a public address system with speakers in most buildings and work areas. In a building- or site-wide emergency, this system will provide you with important information. Follow the directions given, and if instructed to do so, report immediately to the building evacuation assembly area. Additionally, since external help may not be immediately available, LLNL relies on the resources of onsite organizations to protect you. This is known as the Self-Help Program.

The Self-Help Program divides the Livermore site into several self-help zones, each under the direction of a Zone Supervisor. Every zone contains assembly points with leaders who direct local emergency activities.

Each directorate has developed an area-specific self-help plan that provides for:

- Locating and rescuing trapped or injured personnel.
- First-aid response in the absence of assistance from LLNL resources.
- Maintaining the safety and well-being of personnel.
- Locating and reporting obvious damage to facilities.
- Controlling personnel onsite until LLNL site evacuation plans have been coordinated by the Emergency Management Center (EMC) and local law enforcement (e.g., California Highway Patrol and Livermore Police).

Once the Self-Help Program is activated, personnel must follow the LLNL emergency staff's directions and must not leave the site until directed to do so. For more information on the LLNL Self-Help Program, contact your supervisor or the Self-Help Program Office (ext. 4-6045).

Emergency Medical Aid

The Laboratory provides prompt response by state-certified paramedics for all onsite medical problems. However, if you work in an offsite area or are part of the Self-Help teams, you may be required to take a first aid course.

Health Services

The Health Services Department offers a variety of services to LLNL personnel. It provides comprehensive treatment of work-related illness and injury and can assist you with urgent personal medical problems. The Department offers physical therapy for occupational injuries, information on workers' compensation, testing for San Joaquin Valley Fever, skin exams for melanoma prevention, allergy shots, seasonal flu clinics, personal health risk evaluations, and resources to help you achieve your personal health and exercise objectives. The Department also provides medical consultation for workplace health concerns through the ES&H Teams.

The Department's Employee Assistance Program does onsite counseling for employees and their family members. It also provides consultations for managers, supervisors, and employees to resolve workplace issues as well as assistance in managing stress or threats of workplace violence.

Located in Building 663 near the LLNL east entrance, the Health Services Department is available to assist you Monday through Friday, 7:30 a.m. to 4:45 p.m. For more information, call the Department (ext. 2-7459) or go online at http://www.llnl.gov/healthserv/.

Conclusion

This booklet summarizes the ES&H program at LLNL. It describes hazards you may encounter while working and ways to protect yourself and others. It also describes ISM, the approach that all personnel must use to integrate safety into work planning and execution. By taking the time to 1) define the work to be done, 2) analyze the hazards, 3) develop and implement controls, 4) perform the work safely, and 5) gather feedback and learn from your (and others') experiences, we can all improve our safety performance.

No matter what job you do, follow the ISM process to work safely. By consistently using the ISM approach, you can ensure a healthy, accident-free, environmentally sound workplace for everyone at LLNL.

ES&H Resources

The ES&H home page provides links to many resources. You can find it at http://www.llnl.gov/llnl_only/es_and_h/esh.html

The ES&H Teams and the Directorates they support are:

ES&H Team 1 (ext. 2-5211)
Defense and Nuclear Technologies
Director's Office
Experimental Test Site [Site 300]

ES&H Team 2 (ext. 2-6126)
Biology and Biotechnology Research
Computations
Laser Programs

ES&H Team 3 (ext. 2-8794)
Chemistry and Materials Science
Earth and Environmental Science
Engineering
Nonproliferation/Arms Control and International Security
Physics

ES&H Team 4 (ext. 3-9562)
Deputy Director for Operations
Energy Programs

Off-shift Health & Safety Technician (ext. 2-7595)
(off hours, weekends, and holidays)

Health Services (ext. 2-7459)
Appointments (ext. 2-7462)

The LLNL ES&H Hotline (ext. 2-2922)

Emergency Procedures

If an accident occurs at either the Livermore Site or Site 300, do the following:

- Get help. Call 911 immediately (or 925-447-6880 from a cellular phone).
- Don't move injured people unless it is absolutely necessary.
- Secure the area and keep people from reentering.
- Administer first aid only if you know how and it will not endanger you or the victim.
- Notify the responsible individual.
- Follow the instructions of emergency response personnel. If instructed to do so, report immediately to your assembly point.

Wait at the scene until a Fire Fighter or Protective Service Officer arrives. Tell the emergency personnel about the hazards associated with the area. Assist emergency responders if requested to do so.

When reporting an emergency, remember to give the dispatcher the following information:

- What happened and where it happened, including the building and room number.
- An injury assessment.
- Your name and the extension you are calling from.

Remain on the line until the dispatcher tells you to hang up.